

PNI

SEQ ID NO:1

Nucleotide sequence:

ATGGACGCCACCACCGACGCCACCACCGCCAAGCGCAAGCGCCCAGCCG

5 CCTCCGACATCGCCGACGACGCCCCACACCGTCGACGAGGTCTCCGACGCCGAGGTCGAGG
AGTTCTACGCCATCCTCCGCCGATGCGCGACGCCACCCGACGGCTCGGCGCCCCGCCCTCCCC
CGCCGCGCGCGCCGGCGTGGCGCCCCAGCTTCTCTGGGAGGACTTCGCCGACGCGCCGCCCA
AGCAGGCGCCGCGCCGCGCAGCAGCCCGCCGACACGAGCGCGTCGCCGAGAACGCCACC
10 CCGCCCCGGCGCCCGGCGCCCGGCCTCGACCTGAACGTCGAGCCGCGCTCCGACGCGCCGGCC
ACGCCGCGCTCGGCGCGCGCCCCGGCATAGGCGCGCGCCACGAGGAAACGCGCGCGCTCGCG
CATGCGGGTGCTCACGGATTACAACCTTTGCTAGCTAGAAGCAGCTAGCTGCAGTGTGGA
TTGATCCATCCATGGAGCTGCCTTGTCTCCTTGTGTGTGAACAGGTGAGACCTGGTTAATCAA
TCGCTCTTGCTGGGAAGAAACAATCCATTATTGGTCCCATCATGGAGATGTACTATCATGTACC
AAGACAAAATGACGGGTTAATTAATTACCCCTATATTATTCGTTCTGTAATTCAGTAAAAAA
15 AAAAAAAAAAAAAAAAAA

SEQ ID NO:2

Amino acid sequence:

MDATTTDATTAKRKRPAAASDIADDAPTTVDEVSDAEVEEFYAILRRMRDATRRL

20 GARPPPPRAPAWRPSFSWEDFADAPPKQAPPPQPADHERVAENATPPRRPAPGLDLNVEPPSDA
PATPRSARAPA

Rice proteins that interact with the PNI protein:

25 NPR1 Homologue 1 (NH1)

SEQ ID NO:3

ATGGAGCCGCCGACCAGCCACGTACCAACGCGTTCTCCGACTCGGACAGCG

CGTCCGTGGAGGAGGGGACGCCGACGCGGACGCCGACGTGGAGGCGCTCCGCCGCCTCTCC
30 GACAACCTCGCCGCGCGTTCGCTCGCCGAGGACTTCGCGTTCCTCGCCGACGCGCGCATC
GCCGTCCCGGGCGGCGGCGGCGGCGGCGGCGGCGACCTGCGGGTGACCGCTGCGTGCTCTCCGCG
CGGAGCCCCCTTCTGCGCGCGCTCTTCGCGCGCCGCGCCGCCGCGCCGAGGCGGCGGCGGC
GAGGATGGCAGCGAGAGGCTGGAGCTCCGGGAGCTCCTCGGCGGCGGCGGCGGAGGAGGTGGA
GGTCCGGTACGAGGCGCTGCGGCTGGTGCTCGACTACCTCTACAGCGGCCGCGTCCGCGACCT
GCCAAGGCGGCGTGCCTCTGCGTCGACGAGGACTGCGCCACGTCCGGTGCCACCCCGCCGT
35 CGCGTTTATGGCGCAGGTCTCTTCGCCCTCCACCTTCCAGGTGCGCGGACTACCAACCTC
TTCCAGCGCGTCTCCTTGATGTCCTTGATAAGTTGAAGTAGATAACCTTCTATTGATCTTAT
CTGTTGCCAACTTATGCAACAAATCTTGATGAAACTGCTTGAAAGATGCCTTGATATGGTAGT
CCGGTCAAACCTTGACATGATTACTCTTGAGAAGTCATTGCCTCCAGATGTTATCAAGCAGATT
40 ATTGATGCACGCCTAAGCCTCGGATTAATTTACCAGAAAAACAAGGGATTTCTAACAACAT
GTGAGGAGGATACACAGAGCCCTTGACTCTGACGATGTAGAGCTAGTCAGGATGCTGCTCACT
GAAGGACAGACAAATCTTGATGATGCGTTTGCACTGCACTACGCCGTGCAACATTGTGACTCC
AAAATTACAACCGAGCTTTTGATCTCGCACTTGACAGATGTTAATCATAGAAACCCAAGAGGT
TATACTGTTCTTACATTGCTGCGAGGCGAAGAGAGCCTAAAAATCATTGTCTCCCTTTTAACCA
AGGGGGCTCGACCAGCAGATGTTACATTGATGGGAGAAAAAGCGGTTCAAATCTCAAAAAGA
45 CTAACAAAACAAGGGGATTACTTTGGGGTTACCGAAGAAGGAAAAACCTTCTCAAAAAGATAG
GTTATGTATTGAAATACTGGAGCAAGCTGAAAGAAGGGACCCACAACCTCGGAGAAGCATCAG
TTTCTCTTGCAATGGCAGGTGAGAGTCTACGAGGAAGGTTGCTGTATCTTGAAAACCGAGTTG
CTTTGGCAAGGATTATGTTTCCGATGGAGGCAAGAGTAGCAATGGATATTGCTCAAGTGGATG
GAACTTTGGAATTTAACCTGGGTTCTGGTGCAAATCCACCTCCTGAAAGACAACGGACAACCTG
50 TTGATCTAAATGAAAGTCCTTTTATAATGAAAGAAGAACAACCTTAGCTCGGATGACAGCACTCT
CCAAAACAGTGGAGCTCGGGAAACGCTTTTTCCCGCGATGTTTGAACGTGCTCGACAAGATCA
TGGATGATGAAACTGATCCGGTTTCCCTCGGAAGAGACACGTCCGCGGAGAAGAGGAAGAGG
TTTCATGACCTGCAGGATGTTCTTCAAGAGGCATTCCACGAGGACAAGGAGGAGAATGACAG
GTCGGGGCTCTCGTCGTCGTCATCGACATCGATCGGGGCCATTTCGACCAAGGAGATGAAC
55 ACCATTGCTCCCAAATAGTTGCCATATTGATAGCTAACTGTCTCCTGAGGCTACTCACCTGAT
GGTTGCCTTCTGTCAATTGCCCCCAATATATTCTCAATGGTTTAGGCTGTACAGTATTAGT
TCTTACAGTATTGCCCGTCAATTGTGAAACGCAAGGTTTCACTAGTGCTTGTACTCGAGGT
GTAATACAAGTGCTTGAATTTTGAAGTTGTAATTGGAATTTCCAGTGGTTTGCTCGTAAAAATGA
60 GATGATTTCTTGGCAAAAAAAAAAAAAAAAAA

Amino acid sequence:

SEQ ID NO:4

MEPPTSHVTNAFSDSDSASVEEGDADADADVEALRRLSDNLAAAFRSPEDFAFL

ADARIAVPGGGGGGDLRVHRCVLSARSPFLRGVFARRAAAAAGGGGEDGSELELRELLGGGG
EEVEVGYEALRLVLDYLYSGRVGDLPKAACLCVDEDCAHVGCHPAVAFMAQVLFMASTFQVAEL
TNLFQRRLLDVLDKVEVDNLLLILSVANLCNKSCKMLLERCLDMVVRNLDMITLEKSLPPDVIKQ
IIDARLSGLISPENKGFNKHVRRIRALDSDDELVRMLLLEGQTNLDDAFALHYAVEHCDSKIT
TELLDLALADVNHRNPRGYTVLHIAARRREPKEIIVSLTKGARPADVTFDGRKAVQISKRLTKQGD
YFGVTEEGKPSPKDRLCIEILEQAERRDPQLGEASVSLAMAGESLRGRLLYLENRVALARIMFPME
ARVAMDIAQVDGTLEFNLGSGANPPPERQRTTVDLNESPFIKKEHLARMTALSKTVELGKRFFPR
CSNVLDKIMDETDPVSLGRDTSAEKRKRFDLQDV LQKAFHEDKEENDRSGLSSSSSSSTSIGAIRP
RR

NPR1 homologue 2 (NH2)

SEQ ID NO:5

Nucleotide sequence:

TACAATACAAAGATGGAGCAAGGCCAAGAGTCAAACAAAGACAGGTTATGT
ATTGATATATTAGATAGGGAGATGATAAGGAAACCTATGGCAGTGGAAGATTCTGTCACCTCG
CCTTTGTTGGCTGACGATCTTCACATGAAGCTTCTACCTTGAAAACAGAGTTGCATTTGCAA
GATTATTTTTTCTGCAGAAGCAAAGGTTGCAATGCAATTGCACAAGCAGACACCACACCAG
AATTTGGCATTGTTCTGCTGACGCTAGCACTTCTGGAAAATTGAAGGAAGTCGATCTGAACGAGA
CACCAGTAACACAAAAACAAAAGGCTCCGTTCAAGGGTGGATGCACTCATGAAAACAGTTGAG
CTGGGACGTCGCTACTTCCCTAACTGCTCGCAGGTGCTCGACAAATTTCTGGAGGATGATTTGC
CCGATAGTCCTGATGCACTCGACCTCCAAAATGGCACTTCTGATGAGCAAAATGTTAAAAGGA
TGCGGTTCTGTGAGTTAAAGGAGGATGTGCGCAAGGCATTGAGCAAAAGACAGAGCTGATAAT
AGCATGTTTTCTATCTTGTCTATCTTCATCGTCTCTTCGCCACCTCCCAAGGTTGCAAAAGAAAT
GACAGAAGTTTTGTAACAAATTTCCGCTCGTGATGTTACTGGGACAAGAGATATCGATCAATA
GACCTGTATAGTCTTACAGTGGTATAACAATTAGATATCGAAGCTTCTTCGAATATTAGAAAAG
TGCTGTTCTGGGCTGCACTCAGCTGGTTTATGGGACCCATGCGGTGAAACTGGCAAAAGAAAA
CCAGCTGATTAGAGGCTCCAAAGTAGTGTCTCTCGTGAATATGTTTGTAGCATTCTGTTTTGTT
CAGGATGGCTGTAATGATAAAATCTTTTCAATAGATATATAGCTAATTGTCTCGTAAAAAAA
AAAAAAAAAAAAAAAA

SEQ ID NO:6

Amino acid sequence:

YNTKMEQQQESNKDRLCIDILDREMIRKPMAVEDSVTSPLLADDLHMKLLYLEN
RVAFARLFFPAEAKVAMQIAQADTTPEFGIVPAASTSGKLKEVDLNETPVTQNKRLRSRVDALMK
TVELGRRYFPNCSQVLDKFLEDDLPDSDALDLQNGTSDEQNVKRMRFCEKEDVRKAFSKDRAD
NSMFSLSSSSSSPPPKVAKK

3. Nucleolin-like protein

SEQ ID NO:7

Nucleotide sequence:

GATGATAGAGTACCACTACCTAGTTCAAATGGAGCTCCATTGCTCCCGAGTTA
TCCTCCACTTGATATGGTATCATGTGCTAGTACCAGGTGCTATGGTGCTGCTCCTGCTAGTACT
GCACAGCCTATGCTGTATGCTCCAAGAGCTCCTCCAGGGGCAGCAATGGTTCCAATGATGTTA
CCGGATGGTCATCTCGTATATGTTGTACAACAGCCTGGTGGACAGTTGCCGCTGGCTTCGCCGC
CGCCGCAGCAAGCTGGACATCGTAGCGGCAGTGGAGGACGTCATGGCGGCAGTGGCAGCCGC
TATGGCGGTGGTGGTGGCAGCTCCGGCAGTAGCAGGCCCGGTGCAAAACGGCAGAGAGGAGA
TGACAACAGCAGTAGCCGCCACAAAGGCCGGCGCCGCGTACTGATCTGATCAGCATAGCTGT
AGCTACCACTTAGAAGATGTAGTCCGCTCGCAGAAAATTACCAGAAAATCTGGTAGAAATAAT
TTATACTGTTTGTACTCATCGATTTATTAGAAGAATTCGTTTCTGAAACAAGACTGTACATGCG
TATTTACCAGTATTTTCCAATATCGCAGAATTGCTGAAAAAAA

SEQ ID NO:8

Amino acid sequence:

DDRVPLPSSNGAPLLPSYPPLGYGIMSVPGA YGAAPASTAQPMLYAPRAPPGAA
MVPMMPLPDGHLVYVVVQPGGQLPLASPPQQAHRSGSGGRHGGSGSRYGGGGGSSGSSRP
RQRGDDNSSSRHKGRRRRRTDLISIAVATT

PREG-like protein
SEQ ID NO:9
Nucleotide sequence:

5 ATGGACGCCGCCGCGGCAGCGGGCGGCGAGATGTCGCGGCAGAAAGGCGACG
GCGTCGGCTCCGCCGCCGCGGAGCTGGACATGGTGGCGCGCGCCGTGCAGCGGCTGGTGGC
GCGGAACGACGCGGTGGAGGCGCTGAGCGGCGGAGGGGAGGCGGCGGGGGCTAGGAGCA
GGGATGGCGGCGTTCGAGGCGGCGAGGGGCGCGCCGCGCGCATCGGCGTGGCGCAGTA
10 TCTGGAGCGCGTGCACCGGTACGCCGGGCTGGAGCCGGAGTGCTACGTGGTGGCGTACGCGTA
CGTCGACATGGCGGCGCACCGCCGCCCGCCGCGCCGTGCGCTCCCGCAACGTCCACCGCCT
CCTCCTCGCCTGCCTCCTCGTCGCTCCAAGGTTCTCGACGACTTCCACCACAACAACGCGTTC
TTCGCGCGCGTCCGCGGCGTGAGCAACGCGGAGATGAACAGGCTGGAGCTGGAGCTCCTCGC
CGTGCTGGACTTCGAGGTCTGCTCAGCCACCGCGTCTACGAGCTCTACCACGAGCACCTCAA
15 GAAGGAGGCGCGGAGGGACGGCGGCGCGGCGACATGCTCGCGGCGCGTCCGCGCGCGCCG
CCGCCAAGGCGGGGAGAATGGCGCCGTCTCGCCGTCCAAGCTGCTGGAACGCGCGGCGGTG
AACGCGCGCGCGCAGCACGACGACTGGAGGAGCCTGGGTACGGCGGCGGCGGCGGAGGCGG
CGAACGCGGTGCGGCGGCACAGGTCGTCGTCGTCGTCGCGGTATTCCTTCGATTGCTAGTATA
GCCAGCGTTGCCAAAGAGCGCGTTCTGTGTGTATATATCAGGTTATCAACGAGAGTTTTTGA
20 GCTGTAAAAAATTAAAGACGGATTAATTACCTGCCAAAGTGCCAATTAGCAAATGTTTCCCA
TAAAAAAAAAAAAAAAAAAAAAAAAA

SEQ ID NO:10
Amino acid sequence:
MDAAAAAGGEMSRQKATASAPPPPELDMVARAVQRLVARNDAVEALSGGGEA

25 AAGLGAGMAAFEAAARGAPAPRIGVAQYLERVHRYAGLEPECYVVAYAYVDMAAHRRPAAAVAS
RNVHRLLLACLLVASKVLDDFHHNNAFFARVGGVSNAEMNRLELELLAVLDFEVMLSHRVYELY
HEHLKKEARRDGGAGDMLAGASAAAAAKAGRMAAVSPSKLLERA AVNGAAQHDDWRS LGTAA
AAEAANGVRRHRSSSSSRYSFDC

Novel protein
SEQ ID NO:11
Nucleotide sequence:

30 AGTGCTAGTGATGAAGCCCTTGCAAAAGCAGCATCTCTGTATGGAGGTGCTCT
AAGAAATGTTGAGAAAGAGTACGAAGAATTTAATAGAATTTTATCTTCTCAGACTATAGATCC
35 ATTGAGGGCTATGGCTGCAGGCGCTCCCCTGGAAGATGCTCGTGGTCTTGACAACGTTATAG
CCGGATGAGACATGAAGCTGAGATCCTTTCTGCTGAAATTGCTAGAAGGAAGCAACGGGTAC
GAGAAGCTCCAGTTGCTGAGCACACTACGAAGCTTCAACAGTCTGAATCTAAAATGATAGAGC
ACAAAGCAAGCATGGCTGTGTTAGGAAAGGAAGCTGCTGCTGCACTTGCCGCTGTTGAATCTC
AGCAGCAAAGGATAACTCTTCAGCGCCTGGTTGGCATGGTAGAAGCAGAAAAGTTATTTTATT
40 TGAGGTTAGCTGCTATACTTGATGATGTTGAAGCTGAGATGTCCTCTGAAAAGCAAAAGAGAG
AATCTGCACCGCTACTATTCTCATAAGCGTGCTGAGAAGGCCAGTACTTCTTGCTGA
GGCGGTGCATAACTTCAATGGTACCACAGAAAAGGAGTTGAGTTTAATTGTGGTGATTATGTC
G

SEQ ID NO:12
Amino acid sequence:

45 SASDEALAKAASLYGGALRNVEKEYEEFNRLSSQTIDPLRAMAAGAPLEDARGL
AQRYSRMRHEAEILSAEIARRKQRVREAPVAEHTTKLQSES KMIEHKASMAVLGKEAAAALAAV
ESQQQRITLQRLVGMVEAEKLFHLRLAAILDDVEAEMSSEKQKRESAPPTIHSKRAEKAQYFLAE
50 AVHNFNGTTEKELSLIVVIMS

$\frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) \delta(x-a) dx = f(a)$

PPPTTTATTMVKEGEEAPEDLVLPFISRM LIEEDIDDKFFYDYPDNPALLQAQPPFLEILSDPSSNSRS
SNSDDPRLSPTSSSDTSAAINSYDAAATATAVAAA AVVPQYESIELDPAAFFAAANS DLMSSASQ
GDGGGGEQVPPTENKLVIDLEASSEN

SEQ ID NO:19: MN1 cDNA

5 ATGGCAGATGCTAGTTCAAGGACTGACACATCGATTGTTGTAGACAACGACGACAAAAACCA
 CCAGTTAGAAAACGGACATAGTGGTGCAGTCATGGCTTCTAACTCTTCAGATAGATCTGACAG
 ATCTGACAAACTTATGGACCAAAGACAATGCGGCGGCTTGCTCAAAATCGTGAGGCAGCAA
 GAAAAAGTCGGCTGAGGAAAAAGGCATATGTGCAACAACTAGAGAGCAGTAAGCTGAAGCT
 TGCACAGCTAGAGCAGGAACCTCAGAAAGCTCGTCAGCAGGGAATCTTCATCTCTAGCTCTGG
 AGACCAGACCCATGCCATGAGTGGAATGGGGCATTGACTTTTGACTTAGAATACACTAGAT
 10 GGCTCGAGGAGCAAAATAAGCAGATAAATGAGTTGAGGACAGCAGTGAATGCTCATGCAAGT
 GACAGTGACCTTCGTCTTATTGTTGATGGCATAATGGCGCATTATGACGAGGTATTCAAGGTT
 AAGGGTGTAGCTGCAAAGGCCGATGTGTTTCATATACTTTCAGGCATGTGGAAGACACCCGCA
 GAAAGATGCTTCCTGTGGCTTGGTGGTTTCCGTCCATCTGAGCTTCTAAAGCTCCTAGCAAATC
 ACCTCGAACCTTTAACCGAGCAGCAGTTGCTGGGATTAAACAACCTCCAGGAATCTTCTCAGC
 15 AGGCGGAGGATGCACTTTCACAAGGTATGGAAGCACTGCAGCAATCTCTGGCAGATACTTTG
 GCTGGATCTCTCGCTTCATCAGGGTCTTCTGGGAATGTGGCGAACTACATGGGTCAGATGGCA
 ATGGCCATGGGTAAACTAGGAACGCTCGAGAATTTCTTTGCCAGGCGGACAACCTGCGACA
 GCAGACATTGCATCAAATGCAACGAATTCTGACGATCCGGCAAGCCTCGCGTGCTCTTCTTGC
 CATAACGATTACTTTTACGCTTGCGTGCTTTGAGTTCGCTGTGGCTTGCTAGGCCACGGGAG
 TAA

SEQ ID NO:20 MN1 polypeptide

20 MADASSRTDTSIVVDNDDKNHQLENGHSGAVMASNSSDRSDRDKLMDQKTMRRLAQNREAAR
 KSRLRKAYVQQLESSKLKLAQLEQELQKARQQGIFISSSGDQTHAMSGNGALTDFLEYTRWLEE
 25 QNKQINELRTAVNAHASDSDLRLIVDGIMAHYDEVFKVKGVAAKADV FHILSGMWKTPAERCFL
 WLGGFRPSELLKLLANHLEPLTEQQLGLNNLQESSQQAEDALSQGMEALQQSLADTLAGSLASS
 GSSGNVANYMGQMAMAMGKLTLENFLCQADNLRQQTLHQMQRILTIRQASRALLAIHDYFSRL
 RALSSLWLARPRE